REMARKS

INTRODUCTION

In accordance with the foregoing, claim 21 has been amended. Claims 1-29 are pending and under consideration.

CLAIM REJECTIONS UNDER 35 USC 112

Claim 21 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Appropriate correction has been made to claim 21.

Withdrawal of the foregoing rejection is requested.

CLAIM REJECTIONS UNDER 35 USC 102

Claims 1, 7, 10-13, 18, 22 and 26-29 were rejected under 35 U.S.C. 102(b) as being anticipated by Plunkett (US 4,093,900) (hereinafter "Plunkett").

Plunkett discloses a system for blending both dynamic and regenerative electrical braking of the motor whenever it decelerates. In Plunkett, the power source 18 will in most instances be neither totally receptive nor totally non-receptive to regenerative current but will generally be capable of absorbing some percentage of the motor braking current. However, if the source 18 is excessively receptive, i.e., the source voltage is low, the inverter current will tend to rise while the inverter voltage will tend to fall. Since the impulse commutated inverter's ability to commutate current is dependent on the inverter d-c voltage, an excessively receptive line may result in damage to the power conversion apparatus 12 unless the commanded braking torque is reduced. At the other extreme of receptivity, the voltage of power source 18 will rise to an excessive level as regenerative current is pumped back and may result in damage to the semiconductor components of the power control system unless some action is taken to control the regenerative current. Accordingly, there is connected to power regulating circuit 34 a protection circuit 55 which establishes upper and lower voltage limits for power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. Plunkett, 6:49-7:3.

Claim 1

Claim 1 recites: "...a switching controller turning on and turning off one of the first and second switching units provided in respective opposite ends of the inverting part so that the overcurrent consumed by the brake resistors is changeable in proportion to a rotation speed of the motor, when the brake relays short circuit the plurality of motor windings." In contrast to claim 1, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. In claim 1, the switching controller turns on/off one of the first and second switching units provided in respective opposite ends of the inverting part when dynamic braking is operating. Thus, overcurrent consumed by the brake resistor is controlled.

Withdrawal of the foregoing rejection is requested.

Claim 7

Claim 7 recites: "...turning on and turning off one of the first and second switching units provided in respective opposite ends of the inverting part so that the overcurrent consumed by the brake resistors is changeable according to a rotation speed of the motor." In contrast to claim 7, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34 to control the overcurrent consumed by the brake resistors. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. The control method of claim 7 recites turning on and turning off one of the first and second switching units provided in respective opposite ends of the inverting part so that the overcurrent consumed by the brake resistors is changeable. Thus, overcurrent consumed by the brake resistor is controlled.

Withdrawal of the foregoing rejection is requested.

Claim 10

Claim 10 recites: "...brake resistors, respectively, connected to the plurality of motor windings to control an overcurrent generated by the motor when the brake relays short circuit the plurality of motor windings by selectively switching the plurality of first and second switching units; and a controller to control the plurality of first and second switching units in accordance with a rotation speed of the motor, when the brake relays short circuit the plurality of motor windings." In contrast to claim 10, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. In claim 10, the switching controller turns on/off one of the first and second switching units when dynamic braking is operating. Thus, overcurrent consumed by the brake resistor is controlled.

Withdrawal of the foregoing rejection is requested.

Claim 11

Claim 11 recites: "...a controller to turn on and turn off one of the plurality of first and second switching units so that the power exhausted by the brake resistors corresponds to a rotation speed of the motor, when the brake relays short circuit the one or more of the plurality of motor windings." In contrast to claim 11, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. In claim 11, the controller turns on/off one of the plurality of first and second switching units when dynamic braking is operating. Thus, overcurrent consumed by the brake resistors is controlled.

Withdrawal of the foregoing rejection is requested.

Claim 12

Claim 12 recites: "...brake resistors, respectively, connected to the plurality of motor windings to exhaust power from an overcurrent generated by the motor; and a controller to control selective ones of the plurality of first and second switching units so that the power exhausted by the brake resistors corresponds to a rotation speed of the motor." In contrast to claim 12, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34. The protection circuit 55 establishes upper and lower voltage limits for the power conversion

apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. In claim 12, the controller turns on/off one of the plurality of first and second switching units when dynamic braking is operating. Thus, overcurrent consumed by the brake resistors is controlled.

Withdrawal of the foregoing rejection is requested.

Claims 13 and 18

Claim 13 recites: "...brake resistors, respectively, connected to the plurality of motor windings to exhaust power from an overcurrent generated by the motor; and a controller to control selected ones of the plurality of switching units so that the power exhausted by the brake resistors corresponds to a rotation speed of the motor." In contrast to claim 13, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. In claim 13, the controller turns on/off one of the plurality of switching units when dynamic braking is operating. Thus, overcurrent consumed by the brake resistors is controlled.

Claim 18 is dependent on claim 13 and is therefore believed to allowable for the foregoing reasons.

Withdrawal of the foregoing rejection is requested.

Claim 22

Claim 22 recites: "...controlling an overcurrent generated by the motor when short circuiting the plurality of motor windings by selectively switching the plurality of first and second switching units in accordance with a rotation speed of the motor." In contrast to claim 22, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34 to control the overcurrent consumed by the brake resistors. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. The control method of claim 22 recites selectively switching the plurality of first and second switching so that the overcurrent consumed by the brake resistors is controlled.

Withdrawal of the foregoing rejection is requested.

Claim 26

Claim 26 recites: "...exhausting power by the brake resistors corresponds to a rotation speed of the motor, when short circuiting one or more of the plurality of motor windings." In contrast to claim 26, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34 to control the overcurrent consumed by the brake resistors. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. The control method of claim 26 recites that the exhausting power by the brake resistors corresponds to a rotation speed of the motor, not modified by a protection circuit.

Withdrawal of the foregoing rejection is requested.

Claim 27

Claim 27 recites: "...controlling selected ones of the plurality of first and second switching units so that the power exhausted by the brake resistors corresponds to a rotation speed of the motor." In contrast to claim 27, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34 to control the overcurrent consumed by the brake resistors. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. The control method of claim 27 recites controlling selected ones of the plurality of first and second switching units so that the exhausting power by the brake resistors corresponds to a rotation speed of the motor, the exhausting power is not modified by a protection circuit.

Withdrawal of the foregoing rejection is requested.

Claim 28

Claim 28 recites: "...exhausting power from an overcurrent generated by the motor by controlling selected ones of the plurality of switching units so that the power exhausted by the brake resistors corresponds to a rotation speed of the motor." In contrast to claim 28, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34 to control the overcurrent consumed by the brake resistors. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. The control method of claim 28 recites that the exhausting power generated by an overcurrent corresponds to a rotation speed of the motor, it is not modified by a protection circuit.

Withdrawal of the foregoing rejection is requested.

Claim 29

Claim 29 recites: "...braking the motor; and consuming an overcurrent according to the rotation speed of the motor when braking the motor." In contrast to claim 29, Plunkett discloses a protection circuit that is connected to the power regulating circuit 34 to control the overcurrent consumed by the brake resistors. The protection circuit 55 establishes upper and lower voltage limits for the power conversion apparatus 12 and operates to modify the braking or motoring torque commands in order to maintain the inverter voltage within the prescribed limits. The control method of claim 29 recites consuming an overcurrent according to a rotation speed of the motor. The exhausting of overcurrent is not modified by a protection circuit.

Withdrawal of the foregoing rejection is requested.

CLAIM REJECTIONS UNDER 35 USC 103

Claims 2-6, 8, 9, 14-17, 19-21, and 23-25 were rejected under 35 U.S.C. 103(a) as being unpatentable over Plunkett in view of Youn et al. (US 6,369,538) (hereinafter "Youn").

Youn discusses a method for rapidly and smoothly braking a washing machine by treating a revival voltage of the motor braking with hardware and software. Youn, 3:57-3:61.

Claims 2-6

Claims 2-6 are dependent on claim 1 and are therefore believed to be allowable for the reasons discussed above. Further, claims 2-6 recite features that patentably distinguish over Plunkett and Youn, taken alone or in combination. For example, claim 3 recites a speed detecting part detecting the rotation speed of the motor, where the switching controller turns on and turns off the first and second switching units so that the duty cycle of one of the first and second switching units is in proportion to the rotation speed of the motor detected by the speed detecting part.

Withdrawal of the foregoing rejection is requested.

Claims 8 and 9

Claims 8 and 9 are dependent on claim 7 and are therefore believed to be allowable for the reasons discussed above. Further, claims 8 and 9 recite features that patentably distinguish over Plunkett and Youn, taken alone or in combination. For example, claim 9 recites detecting the rotation speed of the motor, where turning on and turning off the one of the first and second switching units comprises: turning on and turning off the first and second switching units according to the duty cycle changed in proportion to the detected rotation speed of the motor.

Claims 14-17 and 19-21

Claims 14-17 and 19-21 are dependent on claim 13 and are therefore believed to be allowable for the reasons discussed above. Further, claims 14-17 and 19-21 recite features that patentably distinguish over Plunkett and Youn, taken alone or in combination. For example, claim 17 recites that each of the first and second switching units comprises: a transistor; and a diode connected in parallel to the transistor.

Claims 23-25

Claims 23-25 are dependent on claim 22 and are therefore believed to be allowable for the reasons discussed above. Further, claims 23-25 recite features that patentably distinguish over Plunkett and Youn, taken alone or in combination. For example, claim 24 recites detecting the rotation speed of the motor; and turning on and turning off the one of the first and second switching units according to the duty cycle changed in proportion to the detected rotation speed of the motor.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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